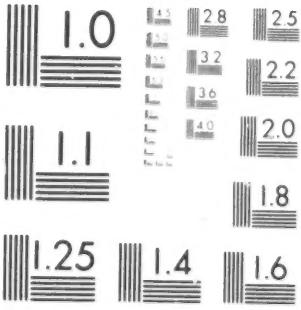

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ABSTRACT

This curricular framework for the subject area section, Industrial Education for Grades 9-12, is one of eight Montgomery County (Maryland) Public Schools (MCPS) Programs of Studies. A foreword discusses Curriculum and Instruction, Use of the Program of Studies, Curriculum Change and Modification of the Program of Studies, State and Federal Government in Relation to the Curriculum, Time Allocations and Graduation Requirements, Interagency Programs, and Availability of Instructional Materials. The Goals of Education adopted by the MCPS Board of Education are provided. A Point of View subsection includes reasons for studying the subject, general outcomes sought, ways in which the area of study is pursued, and relationship to other subject areas. The General Information subsection discusses how the subject fulfills the MCPS Goals of Education, how it is organized for instruction, subject area tests required by county or state, federal and state involvement, and information about fulfillment of graduation requirements. Description of Program, the largest subsection, describes the program and supporting courses and identifies instructional objectives for each. For grades 9-12, it is divided into a List of Courses giving a brief view of subject offerings and Description of Courses giving course title, level, length, code, credit value, and prerequisites. A list of pertinent MCPS instructional guides is appended. (YLB)

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PROGRAM OF STUDIES

INDUSTRIAL EDUCATION, GRADES 9-12

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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Department of Instructional Planning and Development
Montgomery County Public Schools
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FOREWORD

CURRICULUM AND INSTRUCTION

Curriculum may be defined as the general prescription for what teachers should teach and students should learn. In the Montgomery County Public Schools, the *Program of Studies* embodies this prescription. The *Program of Studies* includes the prescribed elements of programs and courses, including course titles, codes, instructional objectives, content descriptions, prerequisites, time allotments, credit values, and a point of view for instruction in each subject area. Based on the MCPS Goals of Education* these prescribed elements constitute the countywide framework within which schools develop and carry out instructional programs tailored to local needs. The relationship of curriculum to instruction in the MCPS, therefore, is that of the more general to the more specific. The *Program of Studies* provides specifications, sets limits, and indicates directions. It has direct and indirect implications for the selection and organization of content, patterns of learning and teaching, and evaluation of outcomes. However, the fulfillment of these specifications and implications is determined at the individual school level. The MCPS instructional program is, therefore, the interaction of the *Program of Studies* framework with the efforts of the individual schools. An appreciation of this interaction is necessary for an understanding of the place of the *Program of Studies* in the work of the schools.

The framework represented by the *Program of Studies* makes possible a unified countywide instructional system which at the same time permits the flexibility of programming required in a large and diverse county. At points, the *Program of Studies* may prescribe instruction very specifically. This may happen with regard to a socially sensitive topic such as sex education, or it may result from the rigorous requirements of establishing an instructional system in mathematics. But this degree of specification is unusual in the *Program of Studies* inasmuch as its level of prescription is generally represented by the instructional objectives it contains for all programs and courses. Instructional objectives are general statements of what the student should attain and are thus appropriate for all students taking a given program or course. Performance objectives are more specific statements of what the student should attain. Formulated or adopted by teachers in relation to the instructional objectives, performance objectives are used in planning classroom instruction. They are thus specific enough to form the basis of day-to-day work and of evaluation of the student's progress. In this movement from instructional to performance objectives, the teacher finds the guidance and the leeway to plan for students of a wide variety of needs and abilities. An examination of the illustrative performance objectives found in instructional guides and in teachers' lesson plans makes clear how great this range is.

An additional means of differentiating instruction which becomes increasingly important at the upper grade levels is provided by elective courses. The use of electives to provide for students of varying abilities and interests differs considerably from subject to subject. Almost all subjects have courses or course sequences which provide for enriched content and advanced or specialized work. Some provide for accelerated movement; some offer additional courses for advanced or specialized work; and some have differentiated paths among required and/or elective courses. The structure of each subject area and the ways by which it employs electives to provide for diverse student needs is indicated in the Grades 9-12 portion of the program description for each subject.

Information regarding each subject area appearing in the *Program of Studies* is presented, when appropriate, as two sections — one for Grades K-8 and one for Grades 9-12. For those subject areas spanning Grades K-12, both sections must be consulted for a full description of the program.

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*Adopted February 12, 1973 by the Board of Education of Montgomery County, Maryland

Each subject area section, whether K-8 or 9-12, has the following subsections: Point of View, General Information, Description of Program, and Instructional Guides.

The Point of View subsection includes reasons for studying the subject, general outcomes sought, ways in which the area of study is pursued in MCPS, and relationships to other subject areas. It also explains how students of varying abilities and interests in the subject are provided with differentiated performance objectives. An explanation of how study of the subject fulfills one or more of the MCPS Goals of Education* is included either in the Point of View subsection or as General Information. For those subject areas spanning Grades K-12, the Point of View is identical in both the K-8 and 9-12 sections.

The General Information subsection includes an explanation of how study of the subject fulfills the MCPS Goals of Education (unless this explanation has appeared in the Point of View) and how it is organized for instruction. Information is given about subject area tests required by the county or state and about federal and state involvement when it is important or distinctive for the subject area. Information about the fulfillment of graduation requirements, Grades 9-12, is also given in some detail for those subjects in which specific requirements exist. Other information specific to the subject also appears.

The largest portion of each subject area section is the Description of Program. It describes the program and supporting courses, identifies the instructional objectives for each, and includes any other prescribed or pertinent elements. For Grades 9-12, this subsection is divided into a List of Courses and a Description of Courses. The List of Courses gives a brief view of subject offerings at this level and serves as a table of contents to the subsection. The course descriptions, along with the narrative material and instructional objectives for each course, give course title, level, length, code, credit value, and prerequisites (if any).

At the end of each subject area section, there appears a list of pertinent MCPS instructional guides. This subsection is amplified to include existing annotated bibliographies, scope and sequence charts, or other such instructional materials in the subject which may have been prepared by MCPS staff.

USE OF THE PROGRAM OF STUDIES

The *Program of Studies*, as the curricular framework for the MCPS, promotes learning through a convergence of educational efforts. Students, teachers, administrators, parents/guardians, and other members of the community use the *Program of Studies* in a variety of ways to achieve the common goal of effective education.

A curriculum stated in terms of general (instructional) objectives informs the *student* of what the school intends him/her to learn and makes it easier to participate in setting specific performance objectives with teachers. Increase in learning efficiency is more apt to take place when a student knows the goal of learning. The student is also more apt to make a commitment to successful learning when at appropriate times he/she is able to select instructional methods and materials. Finally, the student's sense of achievement is reinforced when progress can be noted in the gaining of objectives.

The *teacher* who is familiar with the *Program of Studies* can be more effective in conferring with parents/guardians as well as being in a stronger position to establish specific teaching objectives, plan lessons, select instructional materials, and assess learning progress and teaching functions.

The *school principal* uses the *Program of Studies* as an administrative guide in its listing of approved courses, titles, and codes. The administrator can also deepen staff and community understanding for the

*Adopted February 12, 1973 by the Board of Education of Montgomery County, Maryland

total educational program as the *Program of Studies* is employed in teacher conferences, faculty and department meetings, and parent/guardian meetings. School effectiveness can be enhanced as the principal organizes people and resources to help learners gain the stated ends of instruction.

Learning outcomes and other information included in the *Program of Studies* give *parents/guardians and other members of the community* information useful to them. They can better understand the instructional program for their elementary school children and advise secondary school youth in course selections. Knowledge of the *Program of Studies* also enables families and other community members to communicate more effectively with their children, teachers, and school administrators.

CURRICULUM CHANGE AND MODIFICATION OF THE PROGRAM OF STUDIES

The curriculum of any public school system must reflect the continual change of the society of which it is a part. As the MCPS curriculum changes, the *Program of Studies,* which establishes the MCPS curriculum in printed form, must be modified accordingly.

In MCPS, a proposal for a new or revised program or course can originate with any individual or group in the community or school system. The staff of the Department of Instructional Planning and Development encourages, coordinates, and assists the development of such proposals. In general, the staff has responsibility for modification of curriculum as required by state and local law and policy, and for continual assessment of the need for curriculum change. Procedures for effecting changes in curriculum and the *Program of Studies* are specified in MCPS Regulation 345-1, "Development and Approval of Curriculum and Supporting Materials." These procedures first state the involvement of community and school personnel in the initiation, development, review, and tryout of proposed curriculum changes; describe the role of the Council on Instruction as a reviewing and recommending body for the superintendent; and identify the final steps of approval by the superintendent and the Board of Education. The regulation also cites relevant portions of these Board of Education policies and Maryland public school laws upon which its procedures rest.

STATE AND FEDERAL GOVERNMENT IN RELATION TO THE CURRICULUM

The major influence of the Maryland State Department of Education upon local curriculum has traditionally been through the MSDE's specification of the requirements for graduation from high school. (These graduation requirements and other provisions for earning credit are summarized on page vii.) Two newer and equally important MSDE influences stem from a state educational accountability law* and the currently evolving Project Basic.**

The Maryland Educational Accountability Act imposes several requirements in its implementation of statewide accountability. These include the establishment of goals and objectives in, but not limited to, reading, writing, and mathematics at three levels — state, school system, and individual school. The goals and objectives at the system level must conform with those established at the state level, and those established by individual schools must conform with those of the local system and the state.

Also required by the Act is a school-by-school survey of the current status of student achievement in relation to established objectives, the development of programs by each school for meeting its own needs, and the establishment of evaluation procedures for determining the effectiveness of these programs. Regular reevaluation of programs, goals, and objectives is also a stipulation of the Act.

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*Article 77, Section 28a, of the *Annotated Code of the Laws of Maryland* was passed during the 1972 session of the Maryland General Assembly. The law has come to be called the "Educational Accountability Act."

**See "The Comprehensive Plan Maryland Competency-Based Prerequisites for Graduation," a publication of the Project Basic Office of the Maryland State Department of Education, 1978.

The state plan for implementation of the Accountability Act* specified that, effective the spring of 1974, the Iowa Test of Basic Skills and the Cognitive Abilities Test would be given to all pupils in Grades 3, 5, and 7. Use of these tests has given rise to concerns about the limitations of nationally norm-referenced tests and the small part of the MCPS curriculum that is measured by the ITBS. As a result, the Maryland State Board of Education has adopted a new schedule of assessment which includes the use of the Maryland Functional Reading Test and the Maryland Functional Mathematics Test in the secondary grades. These two tests, developed at the state level, are criterion-referenced tests. This means that they test specific skills or information without regard to how well similar student populations do on a given test item. Students who pass these tests in the ninth grade will not be tested again in connection with this program. Those who fail either test will receive appropriate instruction and retesting.

Through its Project Basic, the Maryland State Board of Education is reaffirming its responsibility for establishing statewide educational standards and stating its commitment to the development of behaviors basic to effective adulthood.** The state board specified five areas of human activity in which students should develop skills and attitudes for life-functioning. The five areas and their definitions as stated in the paper are:

A. Basic Skills — All people must be able to read, write, and calculate.

B. Survival Skills — Schooling should equip all public school youth with these kinds of fundamental skills: consumer, parenting, interpersonal relations, mechanical, and personal finance.

C. World of Work — Schooling should lead to securing employment upon graduation or post-secondary education. All public school youth should be made aware of the options and opportunities of the world of work without racial or sexual bias.

D. World of Leisure — Schooling should help the student become involved in creative and healthful lifetime activities.

E. Citizenship — Citizenship should include becoming involved in the electoral process, participating in local civic affairs, and understanding the system of justice.

To implement this action of the Maryland State Board of Education, State Superintendent of Schools David Hornbeck established the Project Basic Office. Its staff is currently involved in identifying the basic competencies in the five areas. It is also to design and develop instructional activities for the five areas of human activity, develop assessment measures to certify student acquisition of the specified competencies, and coordinate the statewide implementation of minimal competencies as a prerequisite to graduation. The project is to be fully implemented by 1982.

The impact upon the MCPS curriculum of the educational accountability and the competencies programs is as yet difficult to calculate. In one sense, the impact may not be great because the objectives of the accountability program (and, it is anticipated, the competencies of Project Basic) are to a large extent already included in the MCPS curriculum. References to the impact of the educational accountability law on specific portions of curriculum are included in the *Program of Studies* within the Information sections of the descriptions for Reading, English Language Arts, and Mathematics. On the other hand, these two state programs may have a significant impact on curriculum emphasis and

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*See the "Maryland Handbook on the Accountability Assessment Program, Maryland State Department of Education, Adapted to MCPS Test Administration Procedures," issued by the MCPS Department of Pupil and Program Appraisal, February 1, 1974.

**See *The Mission of Schooling*, Maryland State Board of Education, January 1977.

balance. They could affect time allotments within and among subjects and courses and thus affect even the definition of the subjects and courses themselves. How these statewide programs are developed and how MCPS students perform on the required evaluations will determine the impact of these programs upon curriculum. They are certain to have impact upon instruction and probably even more impact on evaluation procedures.

Federal and other state involvement in curriculum is mentioned in the descriptions of those subject areas where it is found, e.g., health education and some of the vocational education subjects.

TIME ALLOCATIONS AND GRADUATION REQUIREMENTS

In the following chart, time allocations are shown for subjects Kindergarten through Grade 8. The allocations are given in minutes per week, and school administrators are expected to use them in establishing program balance.

Subject	K	Grades 1-2	Grades 3-6	Grades 7-8
English Language Arts/Reading	200	700	475	225
Mathematics	75	200	225	225
Music	100	100	100	75
Physical Education	125	150	150	225
Science	75	125	225	225
Social Studies	75	125	225	225
Home Economics and Industrial Education	—	—	—	75
Electives				225
Total	750	1500	1500	1575

The MCPS Policy on the Middle School directs the school system to provide "a curriculum based on the developmental needs of pre- and early adolescents which places primary emphasis on acquisition of basic skills but also provides a wide range of exploratory and enrichment experiences."* Middle schools are organized into interdisciplinary teaching teams which provide opportunities for flexible student grouping and scheduling. Therefore, daily, weekly, and master schedules in middle schools will not be characterized by fixed time intervals for each subject area.

New standards for high school graduation were enacted by the Maryland State Board of Education on November 27, 1974, and became effective for students entering ninth grade in the fall of 1975. These standards thus become effective for all students in Grades 9-12 in the school year 1978-79. The standards define a unit of credit; specify credit requirements for graduation; and list several provisions for earning credit and several alternatives to four-year enrollment. MCPS Regulation 310-3, "High School Graduation Requirements," includes these state graduation requirements, the policy of the Montgomery County Board of Education with regard to them, and guidelines for their implementation.

*The MCPS Policy on the Middle School, adopted December 13, 1977

With exceptions specified under "Alternatives to Four-Year Enrollment," the MCPS student must, beyond the eighth grade, complete four years of approved study and earn a minimum of 20 credits. Twelve and one-half of these credits must be in the areas specified below. The additional seven and one-half elective minimum units may be chosen from offerings in any curricular area.

English Language Arts	4 credits
Social Studies	3 credits (One must be United States History; and one must deal with contemporary issues including local, state, and national governments.)
Science	2 credits
Mathematics	2 credits
Physical Education	One-half credit, required in Grade 9, and one-half credit sometime during Grades 10-12
Physical Activity*	Two semesters of physical activity sometime during Grades 10-12 (One-half credit of elective physical education fulfills the requirement of two semesters of physical activity.)
Health Education	One-half credit, required in Grade 9

The several provisions listed by the state for earning credit in addition to regular school day and school year programs are summer school, evening school, correspondence courses, tutoring, examination, and work study programs or experience outside the school. On pages 10 and 11 of MCPS Regulation 310-3, the Montgomery County Board of Education guidelines for each of these provisions are shown. The provision on credit by examination is being implemented as examinations appropriate to MCPS courses can be developed. During the 1977-78 school year, such examinations were given for Algebra 2; Trigonometry; and English, Grade 12.

The alternatives to four-year enrollment are an accelerated twenty-credit program; an early college admission program; early admission to approved vocational, technical, or other post-secondary school; and a job entry training program. To receive a high school diploma through any one of these alternatives, the MCPS student must receive approval for waiver of the four-year enrollment requirement. MCPS Regulation 310-3 includes the steps for requesting and receiving approval of the waiver. In addition to reading the regulation, which is available in all school offices and in school instructional materials centers, students and parents/guardians should consult local school counselors with regard to any of these provisions or those concerning earning credit outside the regular school day and year.

INTERAGENCY PROGRAMS

As has been stated, the *Program of Studies* prescribes the curriculum for all MCPS students by allowing for much differentiation of instruction. Instructional alternatives are created by varying content, assessment criteria, pace, and the pattern of courses the student takes. Beyond this differentiation, special instruction and other services are provided for handicapped students. In order to provide programs for all handicapped students, MCPS coordinates services with local and state agencies and other resources.

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*See pages 3-4 of the Physical Education Grades 9-12 section of the *Program of Studies*.

For those students who are most severly handicapped, including those who are placed outside of MCPS schools, the MCPS curriculum is adapted as required to meet the limitations of the students. Information about programs for these students is available from the Placement Unit of the Department of Interagency Programs, MCPS Office of Continuum Education.

AVAILABILITY OF INSTRUCTIONAL MATERIALS

The instructional guides listed at the end of each subject area section of the *Program of Studies* are on file in school Instructional Media Centers and in the Professional Library (formerly the Educational Materials Laboratory) at the Educational Services Center. They may be ordered from the Division of Supply Management, Department of School Services, MCPS Office of Supportive Services, which maintains a list of the guides stocked in its warehouse.

Occasionally, there will be a need in a subject area for publication of some supplemental instructional material such as a scope and sequence chart or a bibliography. If such exist, they are also listed at the end of the subject area section.

The Department of Instructional Resources, MCPS Office of Program Development, maintains files of approved textbooks and text materials and of approved films. A list of approved textbooks and text materials is published annually. Questions regarding this list should be addressed to the Division of Instructional Materials, Evaluation and Selection. A list of approved films is published periodically, and questions regarding it should be addressed to the Film Library of the Division of Instructional Materials, MCPS Department of Instructional Resources.

The Goals of Education

Adopted by the Board of Education — February 12, 1973

The goals of education for the Montgomery County Public Schools are set forth in this statement of public policy to guide the school system in developing, implementing, and improving educational programs for its students. This statement outlines those goals considered by the citizens of the county as most important for the education of their children in public schools and for which the citizens will hold the school system responsible and accountable.

The school system has the primary responsibility for some of these goals. For others, it shares that responsibility with the home and other community institutions.

The extent to which these goals can be realized will depend upon the endorsement by and continuing commitment of the school system staff, students, parents, and the community. With broad endorsement and wide support, the Montgomery County Public Schools will continue its development to serve its students and community in the most effective way possible.

Education is a process that encompasses the total experiences of each individual throughout a lifetime of formal and informal learning. The school program, as a keystone in this process, should provide opportunities and encouragement for students to acquire knowledge, to explore ideas, to ask questions, and to seek answers that will lead to sound and useful conclusions.

The probability of success motivates students to learn. Each school must create a program and maintain a climate in which every student has opportunities for success. Each individual is unique, and the school shall encourage that uniqueness. The school should help the student understand his [/her] values and the values of others.

The school program, while developing the skills of learning, should be based on the study of broad human concerns, flexible enough to deal with changing concerns and at the same time related to the needs, interests, and concerns of each student. The program should offer opportunities for decision-making. It should help the student develop the capacity to learn throughout his [/her] lifetime, to respond to and understand other human beings, and to accept full responsibility for the results of his [/her] actions.

Therefore, the Montgomery County Public Schools dedicates itself to provide the opportunity, encouragement, and guidance to make it possible for every child to attain the following goals of education:

ACADEMIC SKILLS

The fundamental responsibility of the school is to develop programs that enable each child to acquire those skills basic to all learning. The achievement of all other goals depends upon the success of the school in ensuring that each student, according to his [/her] own abilities, attain the following basic skills:

- **Reading:** The ability to read and comprehend written material and relate it to other knowledge
- **Composition:** The ability to write with precision, clarity, and acceptable usage, whether to inform, inspire, or persuade
- **Listening and Speaking:** The ability to listen attentively and with understanding and to speak with confidence and effectiveness, whether from written material or extemporaneously
- **Mathematics:** The ability to perform computations, to solve common problems of mathematics and logic, and to understand the structure of mathematics so it can be a useful tool in daily living
- **Study:** The development of basic study skills so that he [/she] may acquire knowledge efficiently
- **The Arts:** The development of some of the basic disciplines and skills in the performing and creative arts to be used throughout his [/her] life for communication, expression, and enjoyment
- **Observation:** The ability to identify and differentiate elements of the world around him [/her] as they are useful in personal, academic, and artistic pursuits

PHYSICAL DEVELOPMENT

Each person matures physically at a different rate and possesses differing capabilities. The school has the obligation to help each student:

- understand the biological functioning of his [/her] body
- make the best both of physical talents and limitations
- develop good health habits, skills, and interests to maintain his [/her] body in optimum condition throughout his [/her] lifetime

INTELLECTUAL DEVELOPMENT

In addition to acquiring academic skills, each individual should develop his [/her] intellectual capabilities to the fullest extent possible. Therefore, the school will encourage each pupil:

- to think creatively
- to reason logically
- to apply knowledge usefully
- to deal with abstract concepts
- to solve problems

THE INDIVIDUAL AND SOCIETY

Every person must learn to live in a society. The school must help each student develop an understanding of [people] and of how the individual depends upon others and they on him [/her]. This requires that each student gain:

- knowledge of himself [/herself] and the characteristics, needs, and desires he [/she] shares with others
- sensitivity to others and their ideas, and the ability to act responsibly in various situations
- the ability to function productively as a member of a group
- familiarity with the legal, moral, ethical, and cultural heritages of his [/her] and other societies
- knowledge of the various political systems and philosophies of the world

SCIENTIFIC UNDERSTANDING

[We] must exist in the natural world. The school must help each student understand nature's impact on [us] and [our] impact on nature. This requires that each student gain:

- knowledge of natural phenomena and their effect on [people]
- understanding of scientific advances and their part in modern technology
- understanding of the scientific method
- appreciation of the ways in which the application of scientific principles can improve the quality of life while preserving the natural order

AESTHETIC EXPRESSION

[We], to realize [our] full potential, must be able to sense and appreciate beauty in the world around [us], whether created by nature or by [people]. The school must help each student gain:

- knowledge of the nature of the creative performing arts
- experience with a wide variety of art forms
- a perspective for developing his [/her] own aesthetic criteria and tastes
- understanding of the contribution of the arts to human communication

CAREER DEVELOPMENT

Productive and satisfying work enriches [our lives]; and with increasing leisure time, many people will use various occupational skills for avocational purposes as well. The school must help each student gain:

- knowledge and appreciation of the wide variety and interrelationships of occupations in modern society
- opportunities to explore potential occupations in relation to personal aptitudes and interests, unrestricted by stereotypes of sex, race, or socio-economic level
- the knowledge, skills, and abilities that enable him [/her] to secure satisfying employment, embark upon further training and education in a chosen career field, and adapt occupational talents to changing job demands and opportunities

COMMITMENTS

The Board of Education and the staff of the Montgomery County Public Schools must create and maintain an educational environment that promotes the attainment of these goals by all students. Toward this end, therefore, the public schools make the following commitments to the citizens of Montgomery County:

- *To attract and retain the most qualified and best trained staff possible through dynamic programs of recruitment, supervision, and continuing in-service training and staff development opportunities*
- *To develop and implement a comprehensive and flexible instructional program to achieve the aforementioned goals and to provide the facilities, materials, and equipment needed to enhance the effectiveness of the program*
- *To evaluate the effectiveness of the instructional program continuously, and regularly report the findings to students, parents, staff, and the community*
- *To adopt new and different approaches when it is determined that they will contribute more effectively to the fulfillment of the goals*
- *To encourage a continuing dialogue with the entire community, making every effort to communicate needs and achievements, and to be responsive to the needs and aspirations of the school community*
- *To utilize facilities and staff, in cooperation with other agencies, in the development of preschool, community school, and adult education programs that will meet the continuing educational needs of all citizens*
- *To provide an accountability procedure for informing county citizens of the objectives and costs of their school system and of reporting periodically on the educational investments made with their tax dollars*

INDUSTRIAL EDUCATION, GRADES 9-12

POINT OF VIEW

In this age of scientific and technological development, the industrial composition of our nation continues to change and to expand. Each year, more and more new workers emerge upon the American industrial scene, while almost daily, new jobs are being created as a result of recent technological developments. The knowledge and skills needed by today's productive citizen will be insufficient for the workers of tomorrow. Today's high school graduates may need to be retrained several times during their work lives. Many children now entering elementary school will find employment in jobs which are nonexistent today.

Industry, as a basic element of our culture, has been one of the most pervasive influences on our way of life. There is need both for specialized training which seeks to develop specific potentialities to a higher level of proficiency and for general understandings and appreciations of those things which characterize an industrial society.

Industrial Education seeks to provide an adequate basis of education which not only develops skills, concepts, and appreciations concerning the world of work but also allows for modification and expansion of these skills and concepts as the industrial character of society changes due to constantly increasing developments in technology.

GENERAL INFORMATION

The industrial education program contributes generally to those MCPS Goals of Education* which emphasize the intellectual development and the scientific understandings of each individual. More specifically, it contributes to the fulfillment of that goal dealing with Career Development:

- Productive and satisfying work enriches [our lives]; and with increasing leisure time, many people will use various occupational skills for avocational purposes as well. The school must help each student gain:

  . knowledge and appreciation of the wide variety and interrelationships of occupations in modern society
  . opportunities to explore potential occupations in relation to personal aptitudes and interests, unrestricted by stereotypes of sex, race, or socioeconomic level
  . the knowledge, skills, and abilities that enable [the student] to secure satisfying employment, embark upon further training and education in a chosen career field, and adapt occupational talents to changing job demands and opportunities

Industrial education includes those curriculum areas which deal with industry and technology. Specifically, the programs found in the schools include:

Industrial Arts Program
Trade/Industrial/Technical Program
Agriculture/Horticulture Program

Courses in the industrial arts program deal with industrial organizational patterns, occupational information, materials, processes, and products as they focus upon both the achievements and problems of an industrial/technical society. Pupils work in laboratory situations to:

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*Adopted February 12, 1973 by the Board of Education of Montgomery County, Maryland

1. identify problems
2. plan logical solutions to problems of design and construction
3. use tools and materials properly and safely when constructing projects
4. evaluate consumer products
5. acquire knowledge about job requirements, job opportunities, and educational background needed to advance in the job
6. develop respect for quality workmanship and for the value of all constructive labor
7. pursue recreational and avocational interests

The trade and industrial (T&I) program provides the opportunity for students to develop specific trade skills, understandings, and abilities directly used in or related to an occupation. Emphasis is placed upon mastery of these skills and understandings to the degree that pupils can qualify for an entry job into the specific occupation upon graduation. Specific courses are offered at one or more of the high schools but are not found in every high school. Students who wish to take a vocational course but who do not attend a high school in which the course is offered, may do so by making application through their home school guidance counselor. (See MCPS Regulation 310-6.) The courses offered in the technical program prepare students to major in engineering and technical curricula at the post high school level as well as preparing them for entry-level jobs in technical fields.

Courses in the agriculture/horticulture program deal with ways in which we both utilize our natural environment and create an environment in which to grow plants and animals for food, fiber, recreation, and beauty. Elements which make up the program are plant science; animal science; ag-mechanics; agri-business; landscape design; floriculture; and nursery production. Emphasis is placed upon the development of understandings and skills necessary for general understanding and/or an occupational pursuit.

Trade and industrial and agriculture/horticulture courses emphasize vocational preparation and are identified with a (V) following the course title. Before a program may be funded with State and Federal vocational money, a program proposal must be approved by the Maryland State Department of Education.

Credits earned in industrial education courses are considered to be elective units and may be applied to the 20 credits required for graduation from high school.

Students enrolled in the program may be charged for materials used in constructing objects which become their personal property. Charges may be made for parts and materials used when vocational classes provide services or repairs.

Safety instruction is an integral part of *all* instruction in industrial education.

DESCRIPTION OF PROGRAM — INDUSTRIAL EDUCATION

List of Courses, Grades 9-12

Agriculture I (V)
Agriculture II (V)
Agriculture III (V)
Agriculture IV (V)

Air Conditioning and Refrigeration I (V)
Air Conditioning and Refrigeration II (V)
Air Conditioning and Refrigeration III (V)

Auto Body and Fender Mechanics I (V)
Auto Body and Fender Mechanics II (V)
Auto Body and Fender Mechanics III (V)

Automotive Fundamentals

Automotive Dealership Mechanics I (V)
Automotive Dealership Mechanics II (V)

Automotive Mechanics I (V)
Automotive Mechanics II (V)
Automotive Mechanics III (V)

Bricklaying I (V)
Bricklaying II (V)
Bricklaying III (V)

Cabinetmaking I (V)
Cabinetmaking II (V)
Cabinetmaking III (V)

Carpentry I (V)
Carpentry II (V)
Carpentry III (V)

Cosmetology I (V)
Cosmetology II (V)
Cosmetology III (V)

Designing, Illustrating, and Drafting Technology I (V)
Designing, Illustrating, and Drafting Technology II (V)

Drawing, Architectural I
Drawing, Architectural II
Drawing, Architectural III

Drawing, Mechanical I
Drawing, Mechanical II
Drawing, Mechanical III

Electricity (Construction) I (V)
Electricity (Construction) II (V)
Electricity (Construction) III (V)

Electricity/Electronics I
Electricity/Electronics II
Electricity/Electronics III

Electronic Technology I (V)
Electronic Technology II (V)

General Industrial Arts

Graphic Arts I
Graphic Arts II
Graphic Arts III

Home Maintenance

Horticulture I (V)
Horticulture II (V)
Horticulture III (V)

Metalworking I
Metalworking II
Metalworking III

Orientation to Construction Trades

Photography

Power Mechanics I (V)
Power Mechanics II (V)

Printing I (V)
Printing II (V)
Printing III (V)

Radio and Television Servicing I (V)
Radio and Television Servicing II (V)
Radio and Television Servicing III (V)

Research and Experimentation in Industrial Arts

Welding I (V)
Welding II (V)
Welding III (V)

Woodworking I
Woodworking II
Woodworking III

Description of Courses, Grades 9-12*

Agriculture I — Grades 9, 10, 11, 12 (V)
5501 1 year 1 credit

Agriculture II — Grades 10, 11, 12 (V)
Prerequisite: Attainment of the objectives for Agriculture I
5502 1 year 1 credit

Agriculture III — Grades 11, 12 (V)
Prerequisite: Attainment of the objectives for Agriculture II
5503 1 year 1 credit

Agriculture IV — Grade 12 (V)
Prerequisite: Attainment of the objectives for Agriculture III
5504 1 year 1 credit

The agriculture program provides experiences in the broad field of agriculture which includes environmental science; horticulture; animal and plant science; mechanics; and agri-business management. The conservation of natural resources is emphasized along with ways in which environmental agriculture contributes to production and the utilization of plants and animals. Career opportunities are investigated; and pupil activities include training — through Future Farmers of America chapters — in leadership, character, thrift, and scholarship. Advanced students who pursue the agri-business aspect are encouraged to enroll in a cooperative program in order to obtain on-the-job experiences.

Upon completion of Agriculture I, the student should be able to:

- identify the breeds of animals and kinds of plants useful in the production of food and/or fiber
- identify the purpose(s) of each of the breeds of animals and kinds of plants
- participate in a chapter of the Future Farmers of America, and understand the purposes of the organization
- develop an awareness of the career opportunities in production and agri-business
- use tools and equipment safely

Upon completion of Agriculture II, the student should be able to:

- keep business records of income, expenses, and labor concerned with plant, animal, or agri-business occupations
- select plants and/or animals according to desirable characteristics
- care for plants and animals so far as feeding, health, and housing are concerned
- perform mechanic functions associated with agriculture equipment and farm maintenance

Upon completion of Agriculture III, the student should be able to:

- make decisions for an agriculture occupation, using business records as a basis for those decisions
- utilize his/her knowledge of management economics to select markets and sell plants and/or animals

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*Abbreviations used within this section:

V = Vocational
DP = double period
TP = triple period
QP = quadruple period

- lead a group discussion and develop competencies in leadership activities
- identify soils and their uses, and recognize proper conservation practices
- demonstrate basic mechanic skills required for maintenance and/or repair of farm equipment, including welding, plumbing, and care of power equipment and small engines

Upon completion of Agriculture IV, the student should be able to:

- select further education or an occupation on the basis of personal contacts and group study
- engage in an agricultural occupation through on-the-job experiences
- analyze business records to make management decisions in production and agri-business
- function effectively within a community organization and/or occupational organization through leadership activities
- demonstrate advanced skills in all areas of farm mechanics

Air Conditioning and Refrigeration I — Grades 10, 11, 12 (V)

5001	1 year	1 credit
5002	1 year (DP)	2 credits

Air Conditioning and Refrigeration II — Grades 11, 12 (V)

Prerequisite: Attainment of the objectives of Air Conditioning and Refrigeration I

5003	1 year (DP)	2 credits

Air Conditioning and Refrigeration III — Grade 12 (V)

Prerequisite: Attainment of the objective of Air Conditioning and Refrigeration II

5004	1 year (DP)	2 credits
5074	1 year (TP)	3 credits

The program is intended to prepare students for entry jobs as airconditioning and refrigeration mechanics. Laboratory experiences include "hands-on" activities as well as learning the theory of refrigeration. Students connect duct work, refrigerant lines, and other piping; connect equipment to power sources; charge systems; and check the operating performance.

Students learn to use a variety of tools, equipment, and testing devices to install, repair, and troubleshoot systems used in homes, offices, restaurants, and other establishments. The installation and repair of auto airconditioning units are included. Students first learn and practice on trainers which can be set up to simulate malfunctions; and then, after gaining experience, they work on actual refrigerators and air conditioners.

Upon completion of Air Conditioning and Refrigeration I, the student should be able to:

- bend, swedge, flare, and solder copper piping for airconditioning and refrigeration systems
- describe the function of a compressor, a condenser, and an evaporator
- locate and determine malfunctions in a refrigerator and an air conditioner
- draw a vacuum and test for leaks in a system
- charge a system with refrigerant

Upon completion of Air Conditioning and Refrigeration II, the student should be able to:

- make electrical connections to airconditioning and refrigeration systems
- replace and/or make minor repairs on motors, compressors, condensers, and evaporators
- install and set regulating devices
- troubleshoot commercial and industrial units for malfunctions

Upon completion of Air Conditioning and Refrigeration III, the student should be able to:

- use blueprints, tools, and equipment with proficiency in servicing and installing refrigeration and airconditioning systems
- determine work load requirements for refrigeration and airconditioning units
- troubleshoot and repair airconditioning and heating units
- estimate service and installation cost

Auto Body and Fender Mechanics I — Grades 10, 11, 12 (V)

5005	1 year	1 credit
5006	1 year (DP)	2 credits

Auto Body and Fender Mechanics II — Grades 11, 12 (V)

Prerequisite: Attainment of the objectives of Auto Body and Fender Mechanics I

5007	1 year (DP)	2 credits

Auto Body and Fender Mechanics III — Grade 12 (V)

Prerequisite: Attainment of the objectives of Auto Body and Fender Mechanics II

5008	1 year (DP)	2 credits

Major areas of instruction in this program include:

1. proper use and care of auto body power- and handtools
2. welding processes
3. methods of repair, removal, and installation of auto body parts
4. relief of stress, stretching, and shrinking auto body sheet metal
5. electrical wiring systems
6. minor frame straightening
7. refinishing preparation and painting
8. estimating materials and costs

Students gain proficiency by practicing on damaged parts of junk automobiles. As skills are developed, students repair damaged parts of cars which are to be put back into service. Safety is stressed as well as quality work.

Upon completion of Auto Body I, the student should be able to:

- identify various hand- and power tools used in the trade
- perform minor welding repairs to body panels
- apply primer and spray paint to small areas with an acceptable degree of skill and proficiency
- know the procedure in preparing a written damage estimate

Upon completion of Auto Body II, the student should be able to:

- perform major repairs, to an acceptable standard, on damaged parts of cars which are to be put back into service
- order and replace new auto body parts for automobiles
- select and mix colors for spray painting
- spray-paint an automobile to an acceptable standard
- estimate the cost of actual repairs according to the service manual

Upon completion of Auto Body III, the student should be able to:

- use tools and equipment with an acceptable degree of skill to enter the job market
- demonstrate knowledge of the various aspects of the auto body and fender repair business
- receive, estimate, and perform repairs on automobiles having structural damage
- demonstrate, with increasing degree of skill, the ability to perform the tasks associated with Auto Body I and II

Automotive Fundamentals — Grades 9, 10, 11, 12
7027 1 semester ½ credit

The course is designed for students who have little knowledge of how and why an automobile operates efficiently. The content provides information about operating and maintaining the automobile from the standpoint of the operator rather than that of the mechanic. Students learn how various mechanical systems contribute to the operation of the car; e.g., steering, brake, suspension, fuel, ignition, engine cooling, and the electrical system. They learn how to perform simple maintenance tasks such as flushing out the cooling system, maintaining proper tire pressure, and maintaining the battery.

Upon completion of Automotive Fundamentals, the student should be able to:

- describe how the mechanical and electrical systems of an automobile function to make the car run
- know and use appropriate terminology relating to the automobile
- demonstrate knowledge about maintenance tasks which must be periodically performed
- display knowledge of good habits with which to operate and maintain an automobile
- perform simple preventive maintenance tasks
- display knowledge of some of the basic duties and responsibilities of an automobile mechanic

The instructor for the course must be certified in the field of industrial education, including at least one course in automotives and/or experience in auto mechanics.

Automotive Dealership Mechanics I — Grade 11, 12 (V)
Prerequisite: Attainment of the objectives of Automotive Mechanics I
5060 1 year (TP) 3 credits

Automotive Dealership Mechanics I A — Grade 11, 12
5061 1 semester 1½ credits

Automotive Dealership Mechanics I B — Grade 11, 12
5062 1 semester (TP) 1½ credits

Automotive Dealership Mechanics II — Grade 12 (V)
Prerequisite: Attainment of the objectives of Automotive Dealership Mechanics I
5066 1 year (TP) 3 credits

Automotive Dealership Mechanics II A — Grade 12
5067 1 semester (TP) 1½ credits

Automotive Dealership Mechanics II B — Grade 12
5068 1 semester (TP) 1 ½ credits

These courses are designed to give advanced students more technical and mechanical skill and knowledge that will prepare them for a career in auto mechanics in a dealership. Instruction and experience are provided in the mini-dealership with the opportunity to train in a regular dealership.

Upon completion of Automotive Dealership Mechanics I, the student should be able to:

- relate knowledge of automotive theory to some of the systems of the automobile
- demonstrate skills necessary to make many repairs on those systems
- identify some basic operations connected with a dealership

Upon completion of Automotive Dealership Mechanics II, the student should be able to:

- show evidence of technical knowledge and theory in all automotive systems
- show evidence of skill necessary to make most repairs on all automotive systems
- show evidence of knowledge and skill necessary to start work in a dealership

Automotive Mechanics I — Grades 10, 11, 12 (V)

5009	1 year	1 credit
5010	1 year (DP)	2 credits

Automotive Mechanics I A — Grades 10, 11, 12

5047	1 semester	½ credit

Automotive Mechanics I B — Grades 10, 11, 12

5048	1 semester	½ credit

Automotive Mechanics I C — Grades 10, 11, 12

5072	1 semester (DP)	1 credit

Automotive Mechanics I D — Grades 10, 11, 12

5073	1 semester (DP)	1 credit

Automotive Mechanics II — Grades 11, 12 (V)

Prerequisite: Attainment of the objectives of Automotive Mechanics I

5011	1 year (DP)	2 credits
5057	1 year (TP)	3 credits

Automotive Mechanics II A — Grades 11, 12

5049	1 semester (DP)	1 credit

Automotive Mechanics II B — Grades 11, 12

5050	1 semester (DP)	1 credit

Automotive Mechanics III — Grade 12 (V)

Prerequisite: Attainment of the objectives of Automotive Mechanics II

5012	1 year (DP)	2 credits
5058	1 year (TP)	3 credits

Automotive Mechanics III A — Grade 12

5064	1 semester (DP)	1 credit

Automotive Mechanics III B — Grade 12

5065	1 semester (DP)	1 credit

Courses in the automotive mechanics program provide students with the technical/mechanical skills and knowledge (theory) needed to become proficient in servicing and/or repairing automobiles. Students electing a two- or three-year-sequence should be capable of finding employment upon graduation. Instruction is organized according to the major systems which make up the automobile; e.g., engine classification; chassis, including steering and brake systems; engine support systems, including cooling, fuel, electrical; performance and driveability, including ignition, emission, and tune-up areas.

Students who complete one year of instruction at a high school may continue the program at their local school or apply for admission to the automotive dealership mechanics program. This program is conducted as a regular used car dealership at the Lincoln Transportation Center. It involves students in servicing and repairing automobiles prior to selling the cars to the public.

Upon completion of Automotive Mechanics I, the student should be able to:

- identify, by name and location within the car, the mechanical, electrical, and fuel systems of the automobile
- apply in a practical way his/her knowledge of automotive theory as it relates to the mechanical, electrical, and fuel systems, by being able to service the car
- perform minor repairs under instructor's supervision
- differentiate various jobs in the automotive mechanic field by describing the tasks to be performed

Upon completion of Automotive Mechanics II, the student should be able to:

- show evidence of general understanding of automotive theory by describing how each system affects the performance of the car
- diagnose the probable reason for malfunctions of a car
- perform with increasing skill and competence the necessary repair work on automobile systems

Upon completion of Automotive Mechanics III, the student should be able to:

- show evidence of competence in handling all materials, problems, and repairs presented in Automotive Mechanics I and II
- assist other students in various jobs in the field of automotive mechanics
- write a service record, and assign work to other students
- act as manager of service, parts, or tools

Bricklaying I — Grade 10, 11, 12 (V)
5013 1 year (TP) 3 credits

Bricklaying II — Grade 11, 12 (V)
Prerequisite: Attainment of the objectives of Bricklaying I
5014 1 year (TP) 3 credits

Bricklaying III — Grade 12 (V)
Prerequisite: Attainment of the objectives of Bricklaying II
5069 1 year (TP) 3 credits

The bricklaying program provides an opportunity for students to learn the fundamental skills of working with brick and block. They learn to construct walls, partitions, fireplaces, and other structures from brick. They also use such other masonry materials as concrete, cinder block, and tile to construct projects. Students learn to use the tools related to the job as they work on a series of projects designed to cover most of the problems encountered in masonry construction. Planning, estimating, and blueprint reading are expected student outcomes of the program.

Upon completion of Bricklaying I, the student should be able to:

- identify and use properly the trowel, level, brick hammer, brick jointer, slicker, brick set, mason's rule, and mason's line to construct masonry projects
- construct masonry projects
- lay brick and block straight to a line
- construct a plumb corner

Upon completion of Bricklaying II, the student should be able to:

- plan and estimate a masonry project
- construct arches, serpentine walls, and fireplaces
- interpret blueprints for masonry projects
- display skills that will enable him/her to gain an entry job as an apprentice bricklayer equivalent to six months at the trade

Upon completion of Bricklaying III, the student should be able to:

- plan and estimate a masonry project
- lay out and construct brick steps
- lay out and construct brick patios
- construct serpentine walls, arches
- display skills that will enable him/her to gain an entry job as an apprentice bricklayer in the trade

Cabinetmaking I — Grades 10, 11, 12 (V)

5015	1 year	1 credit
5016	1 year (DP)	2 credits

Cabinetmaking II — Grades 11, 12 (V)

Prerequisite: Attainment of the objectives of Cabinetmaking I

5017	1 year (DP)	2 credits

Cabinetmaking III — Grades 12 (V)

Prerequisite: Attainment of the objectives of Cabinetmaking II

5018	1 year (DP)	2 credits

Vocational cabinetmaking deals with the construction of cases, cabinets, counters, and other interior woodwork. It includes frame construction, leg and rail construction, box construction, and carcass construction. Students learn to distinguish among the types of construction and learn when to use the appropriate type. They learn how to use various woodworking machines and power tools for cutting and shaping wood. They also learn the different methods of joining pieces of wood, how to use mechanical fasteners, and how to attach hardware. Advanced classes learn to install plastic laminates on surfaces and to apply spray finishes. Students construct cabinets, furniture, and other interior woodwork either for their personal use or on a contracted basis.

Upon completion of Cabinetmaking I, the student should be able to:

- describe the four types of cabinet construction and show examples, from pictures and illustrations of each
- use appropriate hand- and power tools to lay out, cut, shape, drill, smooth, assemble, and apply a finish to various woods

- use the following machines safely and accurately to cut and shape wood; circular saw, radial arm saw, scroll saw, hand saw, planer, jointer, shaper, drill press, and lathe
- differentiate various jobs and opportunities in woodworking by describing the tasks to be performed
- construct basic types of cabinets and furniture

Upon completion of Cabinetmaking II, the student should be able to:

- use woodworking machines and tools with increasing accuracy to lay out, cut, shape, drill, smooth, assemble, and finish wood products
- install plastic laminates on wood or composition surfaces
- produce laminated wood products from veneers
- evaluate consumer products made of wood in terms of construction and function
- construct more complex types of cabinets and furniture

Upon completion of Cabinetmaking III, the student should be able to:

- demonstrate sufficient skill in using tools and equipment to enter the job market
- help to design custom cabinets for a specific use or location
- demonstrate sufficient knowledge of cabinetmaking to obtain a job and function in the task

Carpentry I — Grades 9, 10, 11, 12 (V)

5019	1 year	1 credit
5020	1 year (DP)	2 credits

Carpentry II — Grades 10, 11, 12 (V)

Prerequisite: Attainment of the objectives of Carpentry I

5021	1 year (DP)	2 credits
5045	1 year (TP)	3 credits

Carpentry III — Grades 11, 12 (V)

Prerequisite: Attainment of the objectives of Carpentry II

5022	1 year (DP)	2 credits
5046	1 year (TP)	3 credits

Carpentry is the broad area of woodworking which is concerned with the building of wooden structures. It involves the construction of industrial, commercial, and residential buildings. Carpenters must have a good understanding of wood and construction methods and be able to lay sills and joists; erect studs and rafters; and apply sheathing, siding, and shingles. They must be competent at setting door jambs, hanging doors, building stairs, and constructing cabinets. Because so many skills are involved, carpenters often specialize in either rough construction or finish work. Students in this program are introduced to the activities and requirements of both. They learn to use tools and machines properly and safely; erect buildings from construction lumber; perform finish work inside of buildings; and do limited cabinet work.

Carpentry II and III may be offered for three periods at schools which are part of the construction trades project. Students participating in this project spend most of their time in building houses or other large structures.

Upon completion of Carpentry I, the student should be able to:

- identify by name the structural parts of the floor, walls, and roof of a single unit dwelling; e.g., joist, sub-floor, sill, stud, plate rafter, firestop

- cut structural parts to length, using a hand saw and a radial saw
- assemble construction lumber, by nailing, to form simple floors, walls, roof
- use common layout, cutting, shaping, boring tools to construct frames, partitions

Upon completion of Carpentry II, the student should be able to:

- interpret blueprints and other construction plans for frames, partitions, single unit dwellings
- use common carpenters' tools with increasing accuracy to construct forms from construction lumber
- perform limited finish carpenter jobs; e.g., attaching paneling to walls; attaching trim to doorways; laying wood flooring; constructing interior cabinets
- differentiate various aspects of both rough and finish carpentry work by describing the tasks to be performed in each area

Upon completion of Carpentry III, the student should be able to:

- estimate building cost from blueprints and specification sheets
- prepare simple construction contracts
- perform job foreman tasks
- perform with an acceptable degree of skill in most areas of carpentry
- identify the area or areas of carpentry in which he/she is most interested

Cosmetology I — Grade 10

5023	1 year (TP)	3 credits
5514	1 year (QP)	4 credits

Cosmetology II — Grade 11

Prerequisite: Attainment of the objectives of Cosmetology I

5513	1 year (DP)	2 credits
5024	1 year (TP)	3 credits
5515	1 year (QP)	4 credits

Cosmetology III — Grade 12

Prerequisite: Attainment of the objectives of Cosmetology III

5025	1 year (TP)	3 credits

The course curriculum for Cosmetology I, II, and III is established by the Maryland State Board of Cosmetology. During the 1500 hours of instruction, units must be taught in manicuring; shampooing; permanent waving; pin curls and finger waving; giving facials and scalp treatments; hair coloring; hair cutting and singeing; care of skin; and hair styling. Sanitation, personal hygiene, ethics, selling, courtesy, shop management, and bookkeeping are also emphasized.

A minimum of 1500 class hours of classroom instruction is required for a student to be eligible to take the State Board examination for an operator's license.

After completing 500 hours of fundamental training, pupils may practice beauty culture upon the public in clinics set up by the school.

One science credit may be earned by students who successfully complete a minimum of two years (or 1000 hours) of instruction in Cosmetology.

Upon completion of Cosmetology I and II, the student should be able to:

- give shampoos and apply different types of rinses
- do various sets and comb-outs
- do season cuts and razor cuts for different styles

- do finger waves, cold-wave wrapping, pin curls, skip waves, different scalp treatments, eyebrow arching, and manicuring
- develop and display professional ethics, good grooming, and poise
- use germicides and other sanitary control measures to sanitize equipment
- administer skin tests prior to applying tints or toners to patrons

Upon completion of Cosmetology III, the student should be able to:

- give a complete cold wave
- apply tints, toners, frosting
- do marcel waving and various sets and comb-outs on wigs and wiglets
- give different types of facials and apply facial makeup
- give chemical hair-relaxing treatment
- acquire and then apply acquired knowledge of theory to practicing beauty culture
- pass State Board of Cosmetology examinations and receive a license to practice beauty culture in beauty shops

Designing, Illustrating, and Drafting Technology I — Grades 10, 11, 12 (V)
Prerequisite: Attainment of the objectives of Mechanical Drawing I

5803	1 year	1 credit
5808	1 year (DP)	2 credits

Designing, Illustrating, and Drafting Technology II — Grades 11, 12 (V)
Prerequisite: Attainment of the objectives of Designing, Illustrating, and Drafting Technology I

5804	1 year	1 credit
5809	1 year (DP)	2 credits

This program is designed for students who wish to enter the technical fields of designing, illustrating, and drafting immediately after high school graduation as well as for those who wish to continue further study at a community college or a degree-granting institution.

Instruction includes technical sketching; working drawings; detail drawings; assembly drawings; intersections and development; motion; fasteners, gears, cams, schematic diagrams; map making; topography; and surveying.

Emphasis is placed on understanding the technical fields found in the community.

Upon completion of Designing, Illustrating, and Drafting Technology I, the student should be able to:

- demonstrate competence in making freehand sketches in a technical manner commensurate with those required in industry
- demonstrate skill and competence in the use of all drafting equipment
- possess an understanding of industry, the manufacturing process, and the materials used; and relate these to a drafting problem
- make drawings and read blueprints in revolutions, developments, factors, and working drawings

Upon completion of Designing, Illustrating, and Drafting Technology II, the student should be able to:

- make drawings and read pictorial, schematic, jib, and fixture blueprints
- function within a group in situations similar to those found in industry
- originate designs utilizing all previously stated outcomes

Drawing, Architectural I — Grades 9, 10, 11, 12
7004 1 year 1 credit

Drawing, Architectural I A — Grades 9, 10, 11, 12
7046 1 semester ½ credit

Drawing, Architectural I B — Grades 9, 10, 11, 12
7047 1 semester ½ credit

Drawing, Architectural II — Grades 10, 11, 12
Prerequisite: Attainment of the objectives of Drawing, Architectural I
7005 1 year 1 credit

Drawing, Architectural II A — Grades 10, 11, 12
7048 1 semester ½ credit

Drawing, Architectural II B — Grade 10, 11, 12
7049 1 semester ½ credit

Drawing, Architectural III — Grade 11, 12
Prerequisite: Attainment of the objectives of Drawing, Architectural II
7006 1 year 1 credit

Drawing, Architectural III A — Grade 11, 12
7056 1 semester ½ credit

Drawing, Architectural III B — Grade 11, 12
7057 1 semester ½ credit

Architectural Drawing is designed for the student who wishes to study architectural design or civil engineering. It is also helpful to students who plan to work in the building trades.

The skills learned in Architectural Drawing I are used in practical problem-solving situations. In the first semester, students become acquainted with new terms and drawings involving various aspects of house construction. During the second semester, the student is expected to design and develop a set of basic plans for a dwelling. Architectural Drawing II is a course which permits a student to further investigate and develop skills in architectural design, community planning, landscape design, and structural systems.

Upon completion of Architectural Drawing I, the student should be able to:

- use drafting tools proficiently to construct drawings
- apply standard building practices in designing various structures
- identify the component parts of various types of windows and doors
- discuss various framing procedures
- discuss use of various foundations and footings and their application
- understand and use standard architectural symbols properly
- design and draw plans for a house
- design and draw a plot plan which shows all external features of a lot and their location in relation to house and property lines
- demonstrate knowledge of the processes involved in reproducing drawings

Upon completion of Architectural Drawing II, the student should be able to:

- demonstrate a working knowledge of the design process and problem-solving techniques related to architecture
- develop presentation drawings and renderings of a given design
- construct models or mock-ups of a design solution
- prepare drawings, using drafting materials and equipment found in industry
- demonstrate knowledge of career possibilities in architecture and related fields

The third year of Architectural Drawing provides the opportunity for students to apply previously learned skills with a high degree of proficiency. Students individually contract, with their instructors, content to be learned and projects to be undertaken.

Upon completion of Architectural Drawing III, the student should be able to:

- develop and draw plans for architectural subjects such as a commercial structure or a community development
- prepare a master plan from regional maps and land use plans
- develop presentation drawings and models of final designs in a variety of techniques and media typically used in the fields of architecture and land planning
- develop a proficiency for the terminology, symbols, and standards used in the field of land planning and commercial architectural design
- develop knowledge and skills necessary for career choices and entry level jobs
- develop the ability to design structures that conform to codes and zoning restrictions and that relate to one another in an urban complex

Drawing, Mechanical I — Grades 9, 10, 11, 12
7007 — 1 year — 1 credit

Drawing, Mechanical I A — Grades 9, 10, 11, 12
7030 — 1 semester — ½ credit

Drawing, Mechanical I B — Grades 9, 10, 11, 12
7031 — 1 semester — ½ credit

Drawing, Mechanical II — Grades 10, 11, 12
Prerequisite: Attainment of the objectives of Drawing, Mechanical I
7008 — 1 year — 1 credit

Drawing, Mechanical II A — Grades 10, 11, 12
7032 — 1 semester — ½ credit

Drawing, Mechanical II B — Grades 10, 11, 12
7033 — 1 semester — ½ credit

Drawing, Mechanical III — Grades 11, 12
Prerequisite: Attainment of the objectives of Drawing, Mechanical II
7009 — 1 year — 1 credit

Drawing, Mechanical III A — Grade 11, 12
7054 — 1 semester — ½ credit

Drawing, Mechanical III B — Grade 11, 12
7055 — 1 semester — ½ credit

In the mechanical drawing program, students are given the opportunity to investigate some of the problems related to the language of drawing. Mechanical drawing is often referred to as the universal language of industry. It provides a means by which a student may learn to visualize and express ideas graphically.

Drawing is involved in all areas of industrial arts. It is the medium through which ideas are transferred to materials and is, therefore, basic to the study of all industrial arts. Within this area, students learn to plan, sketch, design, and prepare working plans for the projects they construct. As they perform these activities, they learn many of the problems related to the multiple activities of industry. Included also are related activities such as planning operational procedures, using reference materials, and estimating costs.

Emphasis is on problem solving through the use of mathematics, science, and drawing. Instruction is given in technical sketching and lettering and the use of drawing tools and instruments. Students learn size and shape description; sectioning; auxiliary views; threaded fasteners; and specialized and pictorial drawing.

Excluding the courses in architectural drawing, courses in mechanical drawing offered by MCPS are classified as Mechanical Drawing I, Mechanical Drawing II, and Mechanical Drawing III. The term *mechanical drawing* connotes activities similar to those of drafting in industry.

These courses should be taken in sequence since the learning activities are built upon concepts developed in depth at each level.

Mechanical Drawing I includes units in shape description; size description; sections; auxiliary views; revolutions; developments; pictorial drawing; and specialized drawing.

Upon completion of Mechanical Drawing I, the student should be able to:

- organize information into a workable form and use this information to derive a solution
- reposition an object mentally and recognize the same object drawn in different ways
- prepare sketches describing the size and shape of objects in their true form
- use drafting instruments properly to solve drawing problems
- apply rules of dimensioning and notes to drawings
- visualize objects clearly enough to be able to draw orthographic views, sectional views, revolutions, surface development, and other means of graphic expression as used in industry

Upon completion of Mechanical Drawing II, the student should be able to:

- demonstrate ability to select and use appropriate sketching aids and devices in completing technical sketches
- identify and use basic tools, machines, and equipment common to mechanical drawing
- develop an acceptable lettering style
- understand and draw a set of working drawings
- demonstrate an understanding of dimensioning principles and correctly dimension drawings
- demonstrate the fundamental operation of surveying instruments
- utilize, more effectively, pictorial and orthographic drawing methods learned in Mechanical Drawing I
- apply appropriate drafting methods to problem situations requiring extraordinary views of objects
- demonstrate ability to solve drawing problems in special categories (e.g., gears, cams)
- identify career possibilities in the drafting field

Upon completion of Mechanical Drawing III, the student should be able to:

- apply definitions, rules, and theories related to descriptive geometry
- analyze space relationship problems in order to determine appropriate methods of solution
- apply basic methods of orthographic (multi-view) projection as it relates to point, line, and plane problems
- design a workable combination of mechanisms that apply to simple machines
- make effective use of instruments and equipment used by the technical illustrator to produce line and shading
- develop a design for a product that reflects research and consideration of the fundamentals of project design
- demonstrate knowledge of career education in engineering and related fields

Electricity (Construction) I — Grades 10, 11, 12 (V)

5026	1 year	1 credit
5027	1 year (DP)	2 credits

Electricity (Construction) II — Grades 11, 12 (V)

Prerequisite: Attainment of the objectives of Electricity (Construction) I

5028	1 year (DP)	2 credits
5070	1 year (TP)	3 credits

Electricity (Construction) III — Grade 12 (V)

Prerequisite: Attainment of the objectives of Electricity (Construction) II

5029	1 year (DP)	2 credits
5071	1 year (TP)	3 credits

This program is designed to provide students with experiences and information needed to become competent electricians. Instruction and pupil activities center about the installation and control of electrical systems and devices used in single and multiple dwelling units. Pupils (1) lay out, assemble, install, and test electrical apparatus; (2) install many types of switches, conduits, controls, receptacles, lamps; (3) perform maintenance on electrical apparatus; and (4) interpret blueprints and other specification sheets and drawings, including National Electric Code regulations.

Upon completion of Electricity (Construction) I, the student should be able to:

- identify the components of an electrical circuit found in the home
- install an electric circuit, including conductor controls and outlets
- observe safety precautions when working with electrical tools and equipment

Upon completion of Electricity (Construction) II, the student should be able to:

- read schematic diagrams and blueprints for electrical systems
- install an electrical system in a home
- use tools and equipment with an increasing degree of accuracy

Upon completion of Electricity (Construction) III, the student should be able to:

- display knowledge and skills requisite to employment as an electrician's helper upon graduation
- interpret schematic drawings and plan the procedure for installing electrical systems
- display knowledge about the commercial application of electricity for surveillance, environmental control, etc.

Electricity/Electronics I — Grades 9, 10, 11, 12
7010 — 1 year — 1 credit

Electricity/Electronics I A — Grades 9, 10, 11, 12
7050 — 1 semester — ½ credit

Electricity/Electronics I B — Grades 9, 10, 11, 12
7051 — 1 semester — ½ credit

Electricity/Electronics II — Grades 10, 11, 12
Prerequisite: Attainment of the objectives for Electricity/Electronics I
7011 — 1 year — 1 credit

Electricity/Electronics II A — Grades 10, 11, 12
7052 — 1 semester — ½ credit

Electricity/Electronics II B — Grades 10, 11, 12
7053 — 1 semester — ½ credit

Electricity/Electronics III — Grades 11, 12
Prerequisite: Attainment of the objectives of Electricity/ Electronics II
7058 — 1 year — 1 credit

Electricity/Electronics III A — Grades 11, 12
7059 — 1 semester — ½ credit

Electricity/Electronics III B — Grades 11, 12
7060 — 1 semester — ½ credit

The student learns the scientific and mathematical applications of basic electricity as used in the home and in industry. Skills in the use of tools and testing equipment are taught. Units include occupational and technical information; production and generation of electricity; the function of components in circuits; and the application of scientific principles of magnetism, inductance, resistance, capacitance, resonance, and current flow.

Students acquire extensive knowledge and skills through constructing and operating electrical/electronic devices; wiring electrical circuits used in houses; repairing appliances; and using test equipment. Accuracy and neatness are stressed. Sub-areas of electricity/electronics are specifically identified; and students are encouraged to select certain sub-areas for emphasis. Special attention is given to the development of habits concerning safety, good working relationships, and economical use of time and material.

Upon completion of Electricity/Electronics I, the student should be able to:

- recognize and describe the basic components of an electrical circuit
- interpret wiring and schematic diagrams and trace simple circuits
- use common tools safely to wire simple circuits
- use electrical test instruments accurately to determine voltage, amperage, resistance

Upon completion of Electricity/Electronics II, the student should be able to:

- analyze simple circuits mathematically
- use test data to analyze circuit behavior
- build and align more complex circuits

Upon completion of Electricity/Electronics III, the student should be able to:

- analyze more complex circuits
- use test equipment to diagnose problems in more complex circuits
- replace, repair, rebuild components in the electronic network of various types of equipment

Electronic Technology I — Grade 11 (V)
Prerequisite: Attainment of the objectives of Electricity/Electronics I

5805	1 year	1 credit
5806	1 year (DP)	2 credits

Electronic Technology II — Grade 12 (V)
Prerequisite: Attainment of the objectives of Electronic Technology I

5807	1 year (DP)	2 credits

This course is designed primarily to give the student a comprehensive knowledge of the fundamentals of electronics, including the utilization of mathematics and scientific principles as they apply to electronics. Planned laboratory experiments provide opportunities for the practical application of scientific and technological theory. Fundamental basic circuits; semi-conductors; vacuum tubes and transistors as they function and operate; and the basic electronic systems in radio, television, radar, and microwave systems are studied. The laboratory experiments include the building of specific units; tuning; testing; measuring; troubleshooting; repairing; adjusting; and wiring of various projects. In some schools, instruction is given to prepare students for passing the Federal Communications License examination for 1st or 2nd class radio-telephone permit.

Upon completion of Electronic Technology I, the student should be able to:

- explain simple circuit operation
- design simple circuits and analyze results
- construct complex circuits
- use test instruments to analyze circuits
- apply math and scientific law and principles to the solution of problems in electronic circuitry
- work safely with electrical and electronic components
- read schematic drawings

Upon completion of Electronic Technology II, the student should be able to:

- describe the operation of active circuit elements
- design and describe the operation of complex circuits
- use test instruments and knowledge of circuitry to troubleshoot complex circuits
- write accurate scientific reports
- align and calibrate equipment

General Industrial Arts — Grades 9, 10, 11, 12

7003	1 year	1 credit

General Industrial Arts A — Grades 9, 10, 11, 12

7026	1 semester	½ credit

General Industrial Arts B — Grades 9, 10, 11, 12

7072	1 semester	½ credit

The General Industrial Arts offering permits the student to have experiences with a variety of tools, materials, processes, and products. Emphasis is placed on the development of a positive self-concept, an understanding of the nature of our industrial/technological society, one's place in contributing to that society, and skill development.

Students learn how to use both hand- and power tools safely and effectively. They learn orderly procedures in working with tools, machines, and materials as well as developing safe working habits. Students learn respect for quality in materials and workmanship and appreciate the value of constructive endeavors. Skills are developed in selecting materials, planning, evaluating, collecting, organizing, and presenting data and ideas.

Upon completion of General Industrial Arts, the student should be able to:

- know career opportunities within a cluster of experiences which are compatible with an individual's interests, goals, and talents
- recognize the role that many materials play in a created environment
- identify and solve a variety of design and construction problems
- carry out research and experimentation activities
- work from prescribed plans and procedures to construct a project
- skillfully and safely use a variety of hand tools and power machines
- become a more intelligent consumer
- recognize orderliness and safety as being important in all activities

Graphic Arts I — Grades 9, 10, 11, 12
7012 — 1 year — 1 credit

Graphic Arts I A — Grades 9, 10, 11, 12
7034 — 1 semester — ½ credit

Graphic Arts I B — Grades 9, 10, 11, 12
7035 — 1 semester — ½ credit

Graphic Arts II — Grades 10, 11, 12
Prerequisite: Attainment of the objectives of Graphic Arts I
7013 — 1 year — 1 credit

Graphic Arts II A — Grades 10, 11, 12
7036 — 1 semester — ½ credit

Graphic Arts II B — Grades 10, 11, 12
7037 — 1 semester — ½ credit

Graphic Arts III — Grades 11, 12
Prerequisite: Attainment of the objectives of Graphic Arts II
7014 — 1 year — 1 credit

Graphic Arts III A — Grades 11, 12
7038 — 1 semester — ½ credit

Graphic Arts III B — Grades 11, 12
7039 — 1 semester — ½ credit

The graphic arts program encompasses a wide range of activities and content related to ways in which thoughts and ideas are communicated graphically. Students learn to lay out and prepare both text (words, letters, numbers, symbols) and illustrations (line drawings, sketches, photographs, etc.) for original copy and reproduction. Major areas of instruction include silk screen printing; letterpress printing; offset lithography; intaglio printing; photography; bookbinding; and the use of various inks and papers. In Graphic Arts I, students receive a broad orientation to the various processes and procedures for producing and disseminating graphic or visual information. They produce prints, pamphlets, brochures, and other printed matter using silk screen processes; letterpress processes; and, to a limited degree, offset lithography. Graphic Arts II provides a more in-depth study of offset lithography and adds the area of photography. Pupils are increasingly involved in more production work than in the beginning course. In Graphic Arts III, students explore in depth their areas of interest, including photography and photolithography.

Upon completion of Graphic Arts I, the student should be able to:

- differentiate among the printing processes of silk screen, letterpress, intaglio, and offset lithography
- produce printed materials by each of these printing processes
- design, lay out, and complete a simple job request for printed materials

Upon completion of Graphic Arts II, the student should be able to:

- perform the operations necessary to produce printed materials by the offset process including composing, photographing copy, stripping, platemaking, and printing on a press
- perform the operations necessary to produce photographs including composing the subject, operating the camera, developing film, and making prints
- receive orders for jobs and carry them through to completion
- estimate time and cost problems in production work

Upon completion of Graphic Arts III, the student should be able to:

- develop film, using all darkroom procedures
- work individually to produce quality graphic materials
- perform the tasks relating to Graphic Arts I and II with an increasing degree of skill and proficiency

Home Maintenance — Grades 9, 10, 11, 12
7015 1 semester ½ credit

This course provides students with both information and activities relating to the repair and maintenance of household furnishings, equipment, and structures. Content and activities include (1) window and door repair and installation; (2) minor plumbing and heating repair and maintenance; (3) minor electrical repair and maintenance; (4) wall and floor repair and finishing; (5) furniture repair and refinishing; (6) installation of hooks, hangers, curtain rods, and other hardware associated with wall decorations; (7) small appliance repair. Students practice these repairs in simulated or real conditions in the classroom.

Upon completion of Home Maintenance, the student should be able to:

- make minor plumbing and electrical repairs on equipment found in the home, including small appliances
- perform minor repairs on windows, doors, walls, floors
- repair and refinish furniture
- locate and use information found in service manuals, do-it-yourself books, and other graphic materials relating to the repair, installation, and maintenance of household items

Horticulture I — Grades 9, 10, 11, 12

5506	1 year	1 credit

Horticulture II — Grades 10, 11, 12

Prerequisite: Attainment of the objectives of Horticulture I

5507	1 year	1 credit
5511	1 year (DP)	2 credits

Horticulture III — Grades 11, 12

Prerequisite: Attainment of the objectives of Horticulture II

5508	1 year	1 credit
5516	1 year (DP)	2 credits

This program provides information about trees, shrubs, flowers, and other plants and helps develop skills that will enable students to find employment in nurseries, greenhouses, and other garden supply establishments upon graduation. A variety of experiences include propagating and nurturing small trees, shrubs, plants, and flowers. The importance of planting and arrangements for interior and exterior decoration are included. As students gain knowledge, skills, and experience, they engage in landscape planning for homes and offices.

Upon completion of Horticulture I, the student should be able to:

- identify a large variety of flowers, shrubs, and ornamental plants
- develop a calendar for yearly greenhouse management
- accept the responsibility for plant performance and for all of the equipment and service used in the production of these plant materials
- propagate and grow various herbaceous plants

Upon completion of Horticulture II, the student should be able to:

- plan and execute an annual program for greenhouse production to meet existing demands
- plan and execute the production of nursery stock to meet existing demands
- display knowledge of skills and understanding relating to herbaceous plants, horticulture mechanics, organic gardening, and lawn establishment and maintenance

Upon completion of Horticulture III, the student should be able to:

- design, develop, and modify existing garden nurseries, floral exhibit areas, and other horticulture features
- advise and make recommendations regarding the maintenance of horticulture enterprises such as home lots, public parks, and recreational areas
- analyze and interpret information from trials, tests, research, and the experiences of others in order to make decisions concerning horticulture enterprises

Metalworking I — Grades 9, 10, 11, 12

7017	1 year	1 credit

Metalworking I A — Grades 9, 10, 11, 12

7061	1 semester	½ credit

Metalworking I B — Grades 9, 10, 11, 12
7062 1 semester ½ credit

Metalworking II — Grades 10, 11, 12
Prerequisite: Attainment of the objectives for Metalworking I
7018 1 year 1 credit

Metalworking II A — Grades 10, 11, 12
7063 1 semester ½ credit

Metalworking II B — Grades 10, 11, 12
7064 1 semester ½ credit

Metalworking III — Grades 11, 12
Prerequisite: Attainment of the objectives for Metalworking II
7019 1 year 1 credit

Metalworking III A — Grades 11, 12
7065 1 semester ½ credit

Metalworking III B — Grades 11, 12
7066 1 semester ½ credit

The metalworking courses are intended to provide technical information about the characteristics of various metals used both in construction and in art/craft work; and to develop the skills necessary to plan, lay out, cut, shape, assemble, and apply finishes to various metals. Students work with both ferrous and non-ferrous metals to construct projects which involve these skills. Welding and brazing are an integral part of the program along with other methods of fabrication such as soldering and riveting.

Pupils are taught to use various metalworking tools and machines. Safety observance is emphasized with each tool and each process. Design (as it pertains to metals construction), interpreting plans and blueprints, and the environmental problems created in the processing and manufacture of metals are included in the course content.

Upon completion of Metalworking I, the student should be able to:

- identify by name and characteristics metals such as brass, copper, aluminum, silver, iron, and others
- describe various metalworking processes such as welding, brazing, annealing, stamping, and milling
- use tools and machines properly and safely to perform such operations and processes as cutting, bending, heat treating, soldering, and welding
- design and lay out simple metalworking projects, and interpret drawings relating to the use of metals

Upon completion of Metalworking II, the student should be able to:

- perform tool and machine processes on metals, with an increasing degree of skill and accuracy
- differentiate between electric arc welding and oxyacetylene welding
- demonstrate a greater understanding of metallurgical processes — how they affect the materials and how they are both beneficial and detrimental to people and the environment

Upon completion of Metalworking III, the student should be able to:

- design intricate projects to be made from metal
- further develop skills and understanding about metals as both an art medium and a construction material
- be knowledgeable about metalworking processes such as heat treating, soldering, brazing, welding, machining, decorating; and apply this knowledge to the solution of problems involving metal production

Orientation to Construction Trades — Grades 9, 10
7025 — 1 year — 1 credit

The program is a prevocational cluster approach to learning about the construction trades. Students read and discuss the practices which are required to build any structure such as a road, dam, building, tower, or tunnel. Concepts of construction are then applied to occupational-oriented laboratory activities to reinforce the student's understanding of how people plan, organize, and control all available resources to produce products on a site such as those mentioned above. Students work in teams to construct a house module. Activities begin with site selection and follow the construction process (surveying, designing, preparing drawings, estimating construction, painting, and decorating) through the finished product, which is a 4″ x 6″ section of a house. The house section includes electrical wiring, heating and cooling ducts, plumbing, interior and exterior covering, roofing, and painting.

Upon completion of the Orientation to Construction Trades course, the student should be able to:

- describe the nature of work, the educational requirements, and the skills needed to succeed in various occupations associated with the construction trades
- use the tools and materials of the tradesmen to construct house modules
- understand and describe the concept of interdependence which is needed among specialized tradesmen in order to build and erect structures
- reflect the understanding that most work in which people engage is dignified and contributory

Photography — Grades 9, 10, 11, 12
7067 — 1 year — 1 credit

Photography A — Grades 9, 10, 11, 12
7020 — 1 semester — ½ credit

Photography B — Grades 9, 10, 11, 12
7068 — 1 semester — ½ credit

Students in the photography program are provided experiences with the processes, materials, and equipment used by amateur photographers.

Important areas covered will be choosing a camera; selecting types of lenses; using flash bulbs; using filters; and darkroom procedures. As students progress in the course, they learn effective use of color film as well as special phases of camera use such as landscape photography, still life, portraiture, and silhouettes.

Special treatment of films and papers will be taught; and, when possible, motion picture photography will be touched upon.

Upon completion of Photography, the student should be able to:

- identify the early photographers and describe their important discoveries and contributions
- recognize the common types of cameras; and describe their advantages, disadvantages, and general use
- take candid pictures with basic cameras
- produce film negatives, contact prints, and enlargements, using standard darkroom techniques
- display a knowledge of filters, their function, and their proper use
- recognize good quality in photography as it relates to lighting, composition, exposure, and finishing

Power Mechanics I — Grades 9, 10, 11, 12

5030	1 year	1 credit
5031	1 year (DP)	2 credits

Power Mechanics II — Grades 10, 11, 12

Prerequisite: Attainment of the objectives for Power Mechanics I

5059	1 year	1 credit
5032	1 year (DP)	2 credits

The power mechanics program intends to provide experiences and information about the use and control of power in home and industry. Emphasis is placed on the transmission and control of power through mechanical and electrical devices. Students gain a working knowledge of electrically operated appliances, power lawn mowers, pumps, outboard motors, and other portable gas or electrically operated machines. They learn to apply their technical knowledge and use test instruments to diagnose engine deficiencies and then proceed to repair and/or replace defective parts. Although most of their instruction relates to the gasoline engine as a power source, students also learn about power systems that utilize fluids and electricity.

Upon completion of Power Mechanics I, the student should be able to:

- identify different power systems used in the home and industry
- select and use tools properly and safely to assemble and disassemble engine parts
- perform minor repairs on various motors and engines, under proper supervision

Upon completion of Power Mechanics II, the student should be able to:

- perform major overhaul and repairs on lawn mowers, outboard motors, and electrical appliances
- diagnose and perform minor repairs on automobile engines
- display skills and knowledge that will enable him/her to gain an entry job as a mechanic's helper upon graduation

Printing I — Grades 9, 10, 11, 12

5033	1 year	1 credit
5034	1 year (DP)	2 credits

Printing II — Grades 10, 11, 12

Prerequisite: Attainment of the objectives of Printing I

5035	1 year (DP)	2 credits

Printing III — Grades 11, 12

Prerequisite: Attainment of the objectives of Printing II

5036	1 year (DP)	2 credits

Printing prepares students for useful and gainful employment by developing a variety of skill areas: composition, both hand and cold type; press, both letter and offset; process camera; stripping; lithographic platemaking; layout and paste-up; and bindery. The management phase of the industry, industrial safety, production, and quality control are also taught.

Teaching methods include lectures; demonstrations; audiovisual presentations; use of trade journals, textbooks, and manufacturer's manuals; and class discussions. Most of the course time, however, the student actually works with the equipment, tools, and supplies in the production of real jobs to be used in the school or community.

Upon completion of Printing I, the student should be able to:

- understand and use correct terminology relating to printing
- make a line copy of camera-ready copy
- prepare a plate for offset reproduction
- compose copy for letterpress production
- operate both small letterpress and small offset printing presses

Upon completion of Printing II, the student should be able to:

- receive an order for printed matter and perform the composition, layout, camera preparation, platemaking, and press operations necessary to reproduce the material in quantity
- estimate the cost of a job by computing the cost of both materials and labor for a specified number of copies
- differentiate the various positions within the printing fields, and describe the skills and knowledge needed to succeed in the position
- perform composition, darkroom, press, and bindery operations with increasing skill and accuracy

Upon completion of Printing III, the student should be able to:

- understand and use the instructional manuals for various machines
- make periodic inspections of all machines for wear and need of preventive maintenance
- instruct beginning students on various aspects of the trade
- act as a project leader
- enter the trade as a machine operator or darkroom worker

Radio and Television Servicing I — Grades 10, 11, 12 (V)

5037	1 year	1 credit
5038	1 year (DP)	2 credits

Radio and Television Servicing II — Grades 11, 12 (V)

Prerequisite: Attainment of the objectives of Radio and Television Servicing I

5039	1 year (DP)	2 credits

Radio and Television Servicing III — Grade 12 (V)

Prerequisite: Attainment of the objectives of Radio and Television Servicing II

5040	1 year (DP)	2 credits

The radio and television servicing program is designed to give the student the knowledge and skills required to become employable in this field. Students receive instruction in fundamental circuits, semiconductors, vacuum tubes, transistors (how they function and operate), and the basic circuits applicable to AM and FM radio and television.

Projects and laboratory experiments are designed to teach students both mechanical and electrical construction techniques. Related subjects such as mathematics, industrial processes, cost analysis, estimating, and business management are included as they apply.

Upon completion of Radio and Television Servicing I, the student should be able to:

- define various types of aural and visual communications and broadcasting systems such as amplitude, frequency modulation, and side band
- explain the theory of operation of basic electronic circuits (both tube and solid state) such as oscillators; AF, IF, and RF amplifiers; detectors; and power supplies
- construct, test, and troubleshoot basic AM and FM radio receiving and transmitting circuits

Upon completion of Radio and Television Servicing II, the student should be able to:

- define the fundamentals and standards of television broadcasting systems, including frequencies and band widths
- explain the theory of operation of basic electronic circuits unique to monochrome and color television such as TV synchronization, automatic frequency control, survey deflection, and high voltage systems
- analyze and isolate problems and repair faulty monochrome and color television receivers
- use logical troubleshooting procedures including symptom recognition, symptom elaboration, recognizing faulty function and circuit and failure analysis

Upon completion of Radio and Television Servicing III, the student should be able to:

- relate the problems of industrial processes: cost analysis, estimating, and business management as they apply to radio and television servicing
- pass the certified electronics technicians examination
- demonstrate the knowledge and skills needed to get a job and to progress in radio and television servicing

Research and Experimentation in Industrial Arts — Grades 9, 10, 11, 12
7021 — 1 year — 1 credit

Research and Experimentation in Industrial Arts A — Grades 9, 10, 11, 12
7069 — 1 semester — ½ credit

Research and Experimentation in Industrial Arts B — Grades 9, 10, 1, 12
7070 — 1 semester — ½ credit

The major purpose of the course is to stimulate the curiosity of future engineers, scientists, researchers, and analysts. Emphasis is placed on experimentation techniques and on organized research procedures. Tools, instructional laboratory equipment, and materials are made available to students so that they can test and evaluate products, processes, and materials, using scientific theories and experimental procedures. Students select projects that can be solved through experimental procedures. Each student states a problem, identifies needed materials and testing equipment, and then determines the procedure to be used for valid results. The testing data and results are carefully recorded and presented orally to the class.

The laboratory is the base of operations. School and community resources are used freely in solving problems and determining procedures. Students are given total responsibility for applying their knowledge of other subject content to their research activities.

Upon completion of Research and Experimentation in Industrial Arts, the student should be able to:

- apply the scientific method to problems he/she has to solve
- use community resources to collect data and information
- think critically and analytically
- identify one or more research or experimental vocations
- be self-reliant as he/she pursues solutions to problems or engages in experimental activities
- use scientific apparatus correctly
- use hand tools and machines to construct test apparatus

Welding I — Grades 10, 11, 12 (V)

5041	1 year	1 credit
5042	1 year (DP)	2 credits

Welding II — Grades 11, 12 (V)

Prerequisite: Attainment of the objectives of Welding I

5043	1 year (DP)	2 credits

Welding III — Grade 12 (V)

Prerequisite: Attainment of the objectives of Welding II

5044	1 year (DP)	2 credits

The welding program provides instruction in the processes of both electric-arc welding and oxyacetylene welding for joining pieces of metal. Students are taught the characteristics and welding properties of various metals. They learn to use welding equipment properly and safely to cut metal; to fuse metal pieces together; and to use brass rod to braze metal pieces together. Students also learn to plan and to lay out work from blueprints. As they become proficient in the processes of welding, they are taught to use mig and tig welding machines and the process of carbon-arc welding with a carbon-arc torch. They practice on scrap metal to gain a degree of skill and then construct projects involving the use of heavy iron and steel. Students who complete Welding I, II, and III should be prepared for an entry job into occupational fields involving welding.

Upon completion of Welding I, the student should be able to:

- differentiate between oxyacetylene and electric-arc welding
- select the proper torch, welding rod, and other equipment according to the welding operation to be performed
- fuse metals, using electric-arc welding equipment
- use oxyacetylene equipment to braze different joints in different positions
- practice good safety habits when welding

Upon completion of Welding II, the student should be able to:

- use welding equipment with an increasing degree of skill to join metals together
- make flat, horizontal, vertical up, vertical down, overhead welds on different joints
- make a flat string bead and a weave bead
- select and adjust arc-welding machines properly
- display, through job performance, the knowledge and skills necessary to gain an entry job into an occupational field of welding

Upon completion of Welding III, the student should be able to:

- display, through job performance, the knowledge and skills necessary to gain an entry job into an occupational field of welding
- receive and estimate welding jobs
- perform a variety of welding operations safely and skillfully

Woodworking I — Grades 9, 10, 11, 12
7022 — 1 year — 1 credit

Woodworking I A — Grades 9, 10, 11, 12
7040 — 1 semester — ½ credit

Woodworking I B — Grades 9, 10, 11, 12
7041 — 1 semester — ½ credit

Woodworking II — Grades 10, 11, 12
Prerequisite: Attainment of the objectives of Woodworking I
7023 — 1 year — 1 credit

Woodworking II A — Grades 10, 11, 12
7042 — 1 semester — ½ credit

Woodworking II B — Grades 10, 11, 12
7043 — 1 semester — ½ credit

Woodworking III — Grades 11, 12
Prerequisite: Attainment of the objectives of Woodworking II
7024 — 1 year — 1 credit

Woodworking III A — Grades 11, 12
7044 — 1 semester — ½ credit

Woodworking III B — Grades 11, 12
7045 — 1 semester — ½ credit

Woodworking deals with the ways of processing and utilizing wood for construction and building materials. The program provides both information about wood and wood products and instruction in the use of hand- and power tools in the woodworking field. Exploratory experiences provide insight into the major areas of woodworking. Basic instruction in the areas of furniture construction, cabinetmaking, patternmaking, wood crafts, and boatbuilding are a part of the total three-year sequence. Finishing materials and their application are part of the content. Students learn the technical aspects of wood structure, growth, and physical properties. They also relate numerous industrial methods and processes with the procedures used in the school shop. The project is the vehicle of learning for pupils. Students select projects which are pleasing to them and which contain a variety of woodworking techniques such as woodturning, woodcarving, jointery, gluing and chamfering, and laminating.

Upon completion of Woodworking II, the student should be able to:

- use hand- and power tools with accuracy to make complex cuts and to perform complex operations
- develop a plan (including a sketch) for the construction of a project
- apply a variety of finishes skillfully
- describe the major areas of woodworking and be competent to construct projects in at least two of the areas

Upon completion of Woodworking III, the student should be able to:

- install plastic laminates on wood or composition surfaces
- produce laminated wood products from veneers
- evaluate wooden consumer products in terms of construction and function
- compare school shop safety rules and regulations with those practiced by industry
- identify various manufacturing companies and describe their products
- perform the tasks associated with Woodworking I and II with an increasing degree of skill and proficiency

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